PETRO CHEM ENVIRONMENTAL SERVICES

A Division of Cal State Electric Inc.

Ref. 6

COMPLIANCE TEST REPORT

ARCO ALASKA, INC.
P O Box 100360
Anchorage, Alaska 99510

Attention: Jim Ives

Unit: 44.44 MMBTU/hr. Bohn Heater
Tag # G1-14-01

Determination of NOx and O_2
Permit # PSD-X82-01

Tested: September 6, 1985

Units Tested By:
Leslie A. Johnson

Report #: 50-046

Reviewed By:

PETRO CHEM ENVIRONMENTAL SERVICES

A Division of Cal State Electric Inc.

COMPLIANCE TEST REPORT

ARCO ALASKA, INC.
P O Box 100360
Anchorage, Alaska 99510

Attention: Jim Ives

Unit: 44.44 MMBTU/hr. Bohn Heater
Tag # G1-14-01

Determination of NOx and O_2
Permit # PSD-X82-01

Tested: September 6, 1985

Units Tested By:

Leslie A. Johnson

Report #: 50-046

Reviewed By:

TABLE OF CONTENTS

PETRO
CHEM
ENVIRONMENTAL
SERVICES

I. INTRODUCTION

INTRODUCTION

On September 6, 1985 Petro-Chem Environmental Services performed emissions source test on the emissions of a 44.44 MMBTU/hr BOHN, Inc. Heater (tag # G1-14-01). The crude heater is located at Arco Alaska, Inc.'s Kuparuk unit topping plant (KUTP).

Emissions of NOx and 02 were monitored at the BOHN heater using the following methods:

Parameter	Method	# Runs
NOx	Chemiluminescent NO/NOX Analyzer	3
02	Fuel Cell 02 Analyzer	3

Unit Operations Cummulation Fuel Meter

Emission test were requested by Arco to document compliance with EPA permit # PSD-X82-01.

An oxygen traverse was performed on a cross sectional grid using EPA method #2 to determine sample points. After confirming that no oxygen stratification existed a single sample point was used for run #2 and #3.

The source tests were conducted by Leslie A. Johnson and Andy Winkler of Petro-Chem Environmental Services. Mr. Jim Ives of Arco Alaska, Inc. was on site to oversee the heaters performance.

PETRO
CHEM
ENVIRONMENTAL
SERVICES

II. SUMMARY OF RESULTS

[redacted] A[redacted]KA
Bohn Heater (44.44 MMBTU/hr)

SUMMARY OF RESULTS

NOx Emissions

NOx, ppm	NOx, ppm @ 3% O_2	lbs/MMBTU	Grams/Joule
68.21	81.80	0.100	$4.3 * 10^{-8}$

NOx Permit Conditions

(permit #PSD-X82-01)

Unit	Rating	Allowable NOx Emissions	Actual NOx Emissions
Bohn Heater	44.44 MMBTU/hr	0.18 lbs/MMBTU	0.100 lbs/MMBTU

PETRO
CHEM
ENVIRONMENTAL
SERVICES

III. SOURCE OPERATION

BOHN CRUDE HEATER

The crude heater (G1-1401) at the Kuparuk Unit Topping Plant (KUTP) was tested on September 6, 1985 for compliance with the NO_x emissions standards. The heater is utilized to heat crude oil during the production of diesel fuel. The facility can process up to 13000 BOPD and provide a maximum of 3000 barrels of diesel per day.

The Bohn horizontal heater is fired by two John Zink low NO_x Burners (PNCV - Size 70). Each burner has a maximum rating of 22.22 MMBtu/hr. The maximum potential heat release of the heater is 44.44 MMBtu/hr; however, the maximum operating heat release is about 40 MMBtu/hr. The normal operating heat release is 35.56 MMBtu/hr.

JAI2:tlh-20044.1

ARCO ALASKA INC.
Bohn Heater Tag #G1-14-01
9/6/85

OPERATING CONDITIONS

Time	Gas Temp F°	Pres. Psig	Fuel use (MMSCFh)	Cummulative Fuel use (MSCF)
1153	105.4	162.4	31831	331723
1219	105.8	162.4	31704	
1259	104.0	162.5	31601	331757
1423	105.7	162.6	32116	331802
150 min.	1.4.8 (520.9 ÷ 4 = 105.2)		31813	79 MSCF

$$79 \text{ MSCF} \ / \ 150 \text{ min} * \frac{60 \text{ min}}{1 \text{ hr.}} = 31.6 \text{ MSCF/hr}$$

PROCESS OPERATING CONDITIONS

Unit	Design	Normal Maximum	Actual During Test	% Operation
Bohn Heater	44.44 MMBTU/hr	35.56 MMBTU/hr	37.58 MMBTU/hr	85

$$\text{MMBTU/hr} = \text{MMSCFh} * \frac{\text{BTU}}{\text{SCF}}\ ^{1/} * \frac{\text{MMBTU}}{10^6 \text{ BTU}} * \frac{10^6 \text{SCF}}{\text{MSCF}}$$

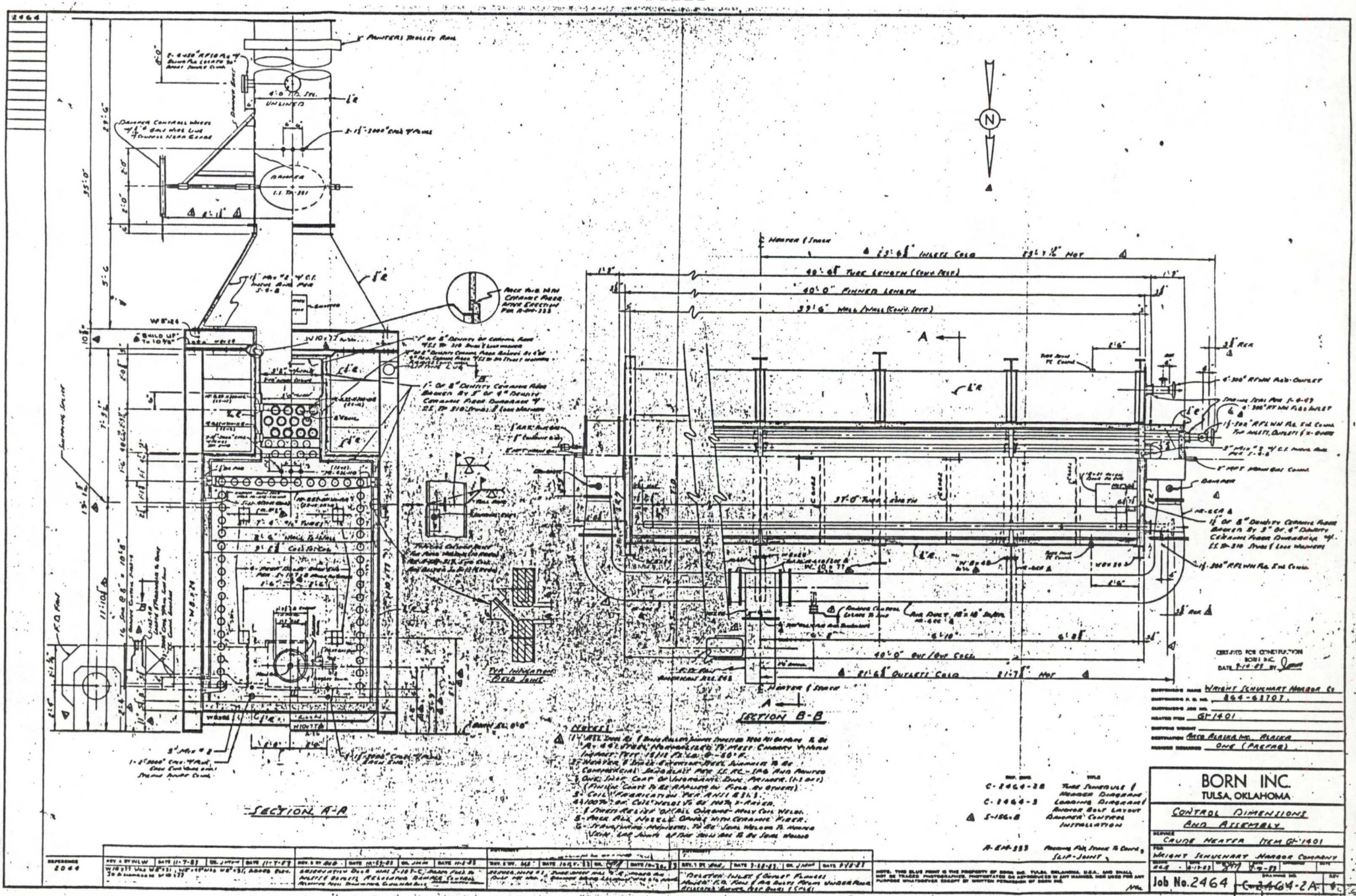
1/ 1189.4 BTU/SCF (see Appendix B)

PETRO
CHEM
ENVIRONMENTAL
SERVICES

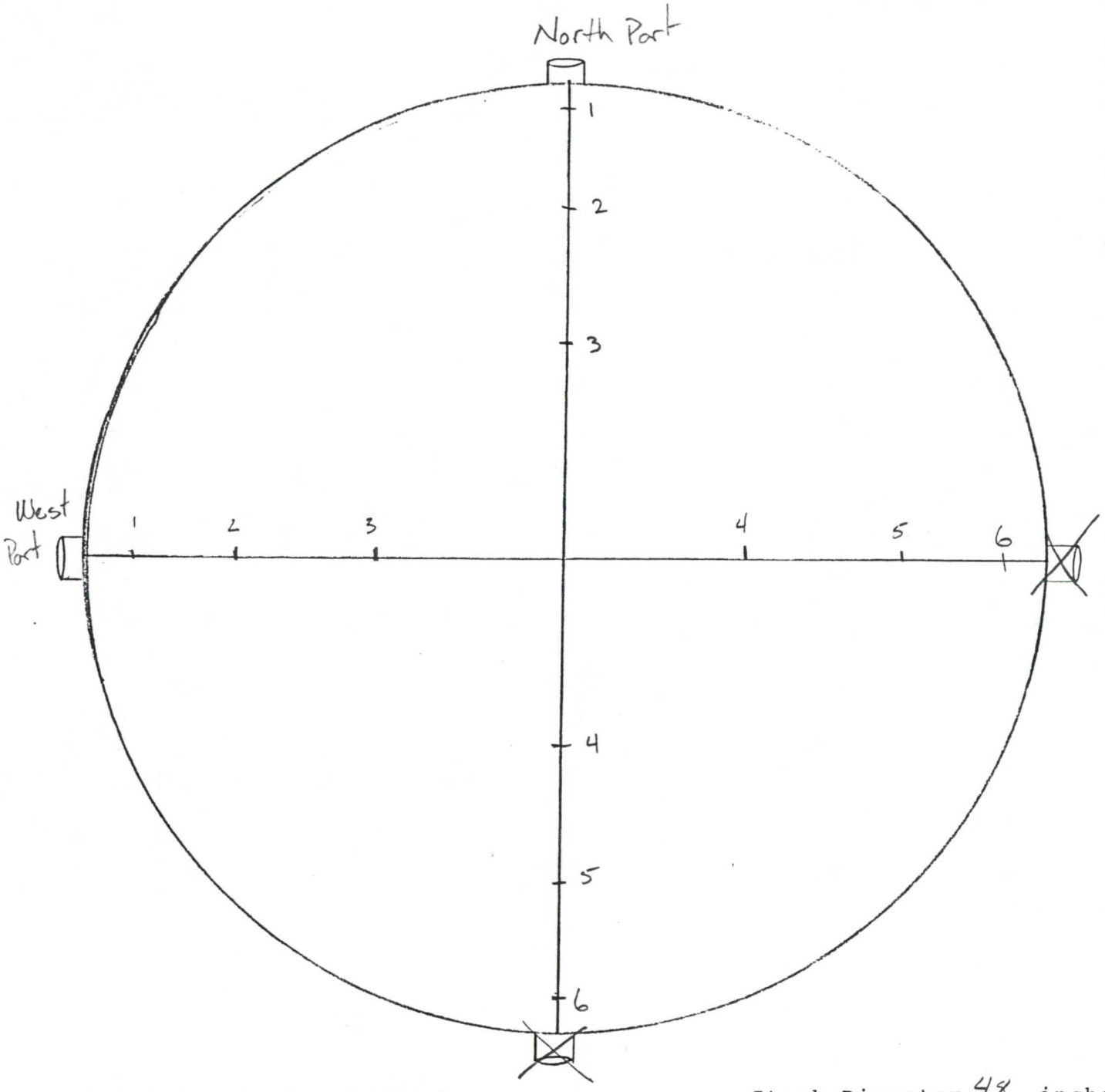
IV. SAMPLING AND ANALYSIS PROCEDURES

BORN HEATER

KUPARUK FIELD



POINT LOCATIONS



Point #	inches from edge
1	2.1
2	7.0
3	14.2
4	33.8
5	41.0
6	45.9
~~7~~	
~~8~~	
~~9~~	
~~10~~	

Stack Diameter 48 inches
Stack Area 12.57 ft^2
Diameters before 2
Diameters after 5.5
a disturbance.

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)

Reference: BAAQMD, Manual of Procedures; ST-13A, St-19A, Jan 1982 State of California, Air Resources Board, Test Methods 1-100, June 1979.

INSTRUMENTATION SUMMARY:

A constant sample of flue gas was extracted, dried, filtered, and delivered to an instrument manifold system for distribution to one or more analyzers. Instrument results are recorded on an analog strip chart recorder. System calibration checks are performed at the beginning and end of each day as well as calibration check at the beging and end of each test run. Final data reduction includes zero and calibration drift corrections.

SAMPLE CONDITIONING SYSTEM:

Consists of a borosilicate glass tube or 316 grade stainless steel probe fitted with a cindered stainless steel or pyrex glass wool particulate filter. The probe is fitted with a teflon (TFE) sample line which connects to a water condensation system located at the sources. The condensation system consists of two 500 ml stainless steel impingers connected in a series, immersed in an ice bath. The gas is delivered to the instrument trailer with a teflon line (3/8"O.D.) through an in line Balston particulate filter drawn by a teflon coated diaphram pump. Sample gas is pressurized through a Hankinson gas conditioner which further reduces sample gas moisture insuring against water interferance with the instruments. The sample system is leak checked prior to sampling by plugging the end of the sample probe and adjusting the sample pump to it's maximum rate (approximately 22"Hg). The manifold is bypassed and the leak rate monitored through a gas meter or low range flow meter.

MANIFOLD SYSTEM:

Sample gas is delivered to each analyzer through a five (5) way valve and regulated with a needle valve flowmeter. Manifold pressure is controlled by a back presure regulator which is typically set at three (3) psi. Zero gas (N_2) and calibration gases are delivered to the analyzers using the same five-way valve and flowmeter All manifold parts are glass, stainless steel, or teflon materials.

CALIBRATION PROCEDURES:

A. **System Calibration Procedures:**
System calibration checks are performed at the begining and end of each test day to insure against sample system leaks or contamination. Calibration gas is introduced at the sample probe tip at a normal sample rate and vacuum, the final instrument value must be within ±5% of the calibration gas value.

B. **Manifold Calibration:**
Instrument calibration checks are performed and adjustments made before and after each test run. Each analyzer is checked with a zero grade nitrogen gas for a zero baseline and then with a calibration gas similar to the expected sample concentration (60-90% of full scale). Calibration gases used in both manifold and system calibrations are with EPA protocol No. 1 gas (traceable to National Bureau of Standards SRM,) or with gases recently analyzed by EPA Reference Methods. All zero and calibration checks are documented and noted on the recorder strip charts.

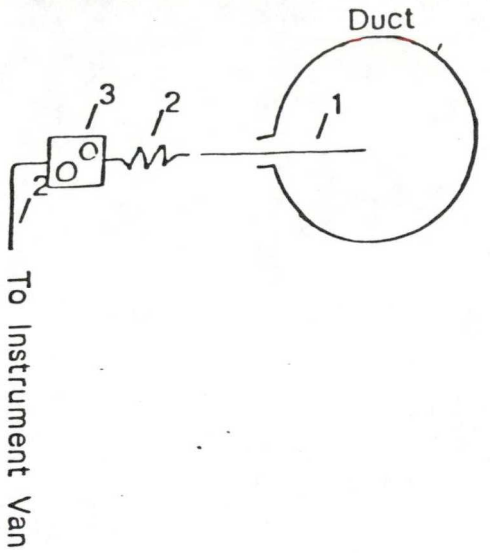
ANALOG STRIP CHART DATA REDUCTION:

Analog recordings were averaged of time increments as shown on the data pages (typically 5, 10, or 20 minute increments). Data for each incriment was recorded at an average percent of full scale. The readings were then compared with the zero and calibration readings for calculation of the average concentration for each time increment. Any deviation of the zero and calibration readings from the start to the end of a test period was corrected by calculating apparent zero and calibration readings for the mid-point or each time incriment. The average concentrations were then calculated from the sample readings and the apparent zero and span readings.

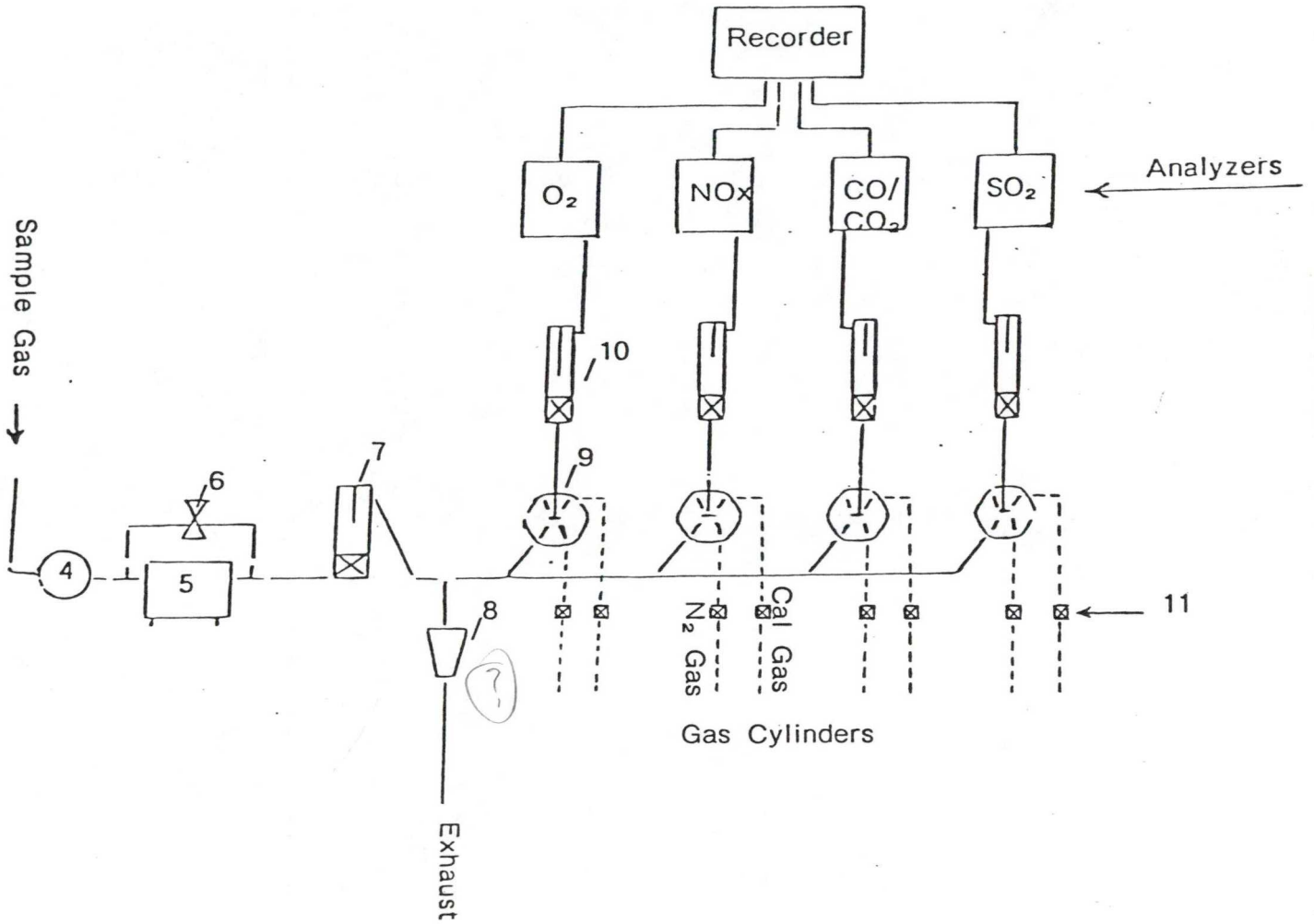
ANALOG STRIP CHART DATA REDUCTION:

Analog recordings were averaged of time increments as shown on the data pages (typically 5, 10, or 20 minute increments). Data for each incriment was recorded at an average percent of full scale. The readings were then compared with the zero and calibration readings for calculation of the average concentration for each time increment. Any deviation of the zero and calibration readings from the start to the end of a test period was corrected by calculating apparent zero and calibration readings for the mid-point or each time incriment. The average concentrations were then calculated from the sample readings and the apparent zero and span readings.

PNEUMATIC DIAGRAM



1) 316 Stainless Steel Probe
2) Teflon Sample Line
3) Sample Gas Conditioner
4) Filter
5) Teflon Coated Diaphram Pump
6) By-Pass Control Valve
7) Sample Flowmeter
8) Back-Pressure Regulator
9) 5-Way Gas Selection Valve
10) Instrument Flowmeter
11) Metering Valves



RESPONSE TIME

Date of Test: September 2, 1985

Analyzer Type: NO/NOx Thermo Electron Analyzer

Span Gas Concentration: 100 (ppm) or %)

Zero Gas Source: Ambient Air

Upscale:

1) 45 seconds
2) 50 seconds
3) 50 seconds

Average upscale response 48.3 seconds.

Downscale:

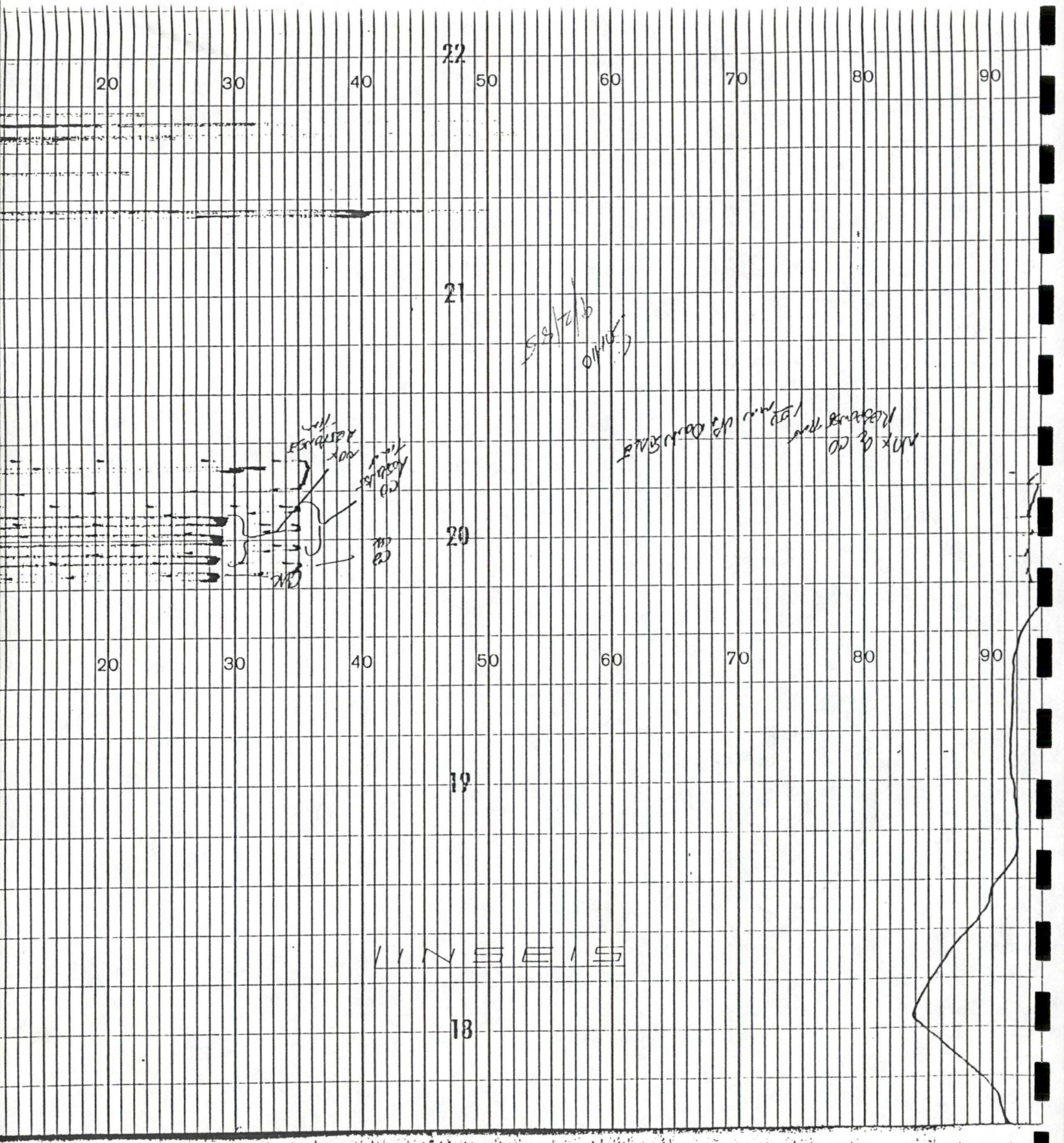
1) 45 seconds
2) 45 seconds
3) 40 seconds

Average downscale response 43.3 seconds.

Systems response time 60 seconds.

This is response time
cheat, but it's
not clear what
is wrong there

CBW, 12/13


22
20
30
40
50
60
70
80
90
21
20
19
18

PETRO
CHEM
ENVIRONMENTAL
SERVICES

V. APPENDIXES

ARCO ALASKA, INC.
Bohn Heater

NOx RESULTS

Run #	Time	% O_2	NOx ppm	NOx ppm @ 3% O_2	NOx lbs/MMBTU
1	1155-1255	5.94	64.71	77.44	0.095
2	1300-1340	6.01	69.96	84.07	0.103
3	1345-1425	5.97	69.96	83.88	0.103
Average		5.97	68.21	81.80	0.100

$$\text{lbs/MMBTU} = \text{ppm} * \frac{20.9}{20.9 - \%O_2} * \text{MW} * \text{F factor} * 2.635 * 10^{-9}$$

ARCO ALASKA, INC.
Bohn Heater

NOx RESULTS

Run #	Time	% O_2	NOx ppm	NOx ppm @ 3% O_2	NOx lbs/MMBTU
1	1155-1255	5.94	64.71	77.44	0.095
2	1300-1340	6.01	69.96	84.07	0.103
3	1345-1425	5.97	69.96	83.88	0.103
Average		5.97	68.21	81.80	0.100

$$\text{lbs/MMBTU} = \text{ppm} * \frac{20.9}{20.9 - \%O_2} * \text{MW} * \text{F factor} * 2.635 * 10^{-9}$$

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX A

NOx and O_2 RESULTS

COMPANY:ARCO ALASKA, INC
DATE: 9-6-85
UNIT: KUPARUK BOHN Heater Tag #G1-14-01

RUN# 1
NOX/O2 DATA

	TIME INTERVAL BEGIN	END	CONCENTRATION;FULL SCALE O2;fs	NOx;fs	CONCENTRATION; CORRECTED O2;%	NOx;ppm
1	1155	1200	34	23.3	5.90	66.46
2	1200	1205	34	23.3	5.90	66.46
3	1205	1210	34	23.2	5.90	65.96
4	1210	1215	33.5	23	5.78	64.96
5	1215	1220	33.5	23	5.78	64.96
6	1220	1225	33.5	23	5.78	64.96
7	1225	1230	34	23	5.90	64.96
8	1230	1235	34	23	5.90	64.96
9	1235	1240	34.5	23	6.02	64.96
10	1240	1245	35	22.6	6.15	62.96
11	1245	1250	35	22.6	6.15	62.96
12	1250	1255	35	22.4	6.15	61.96
	1155	1255	33.75	23.13	5.94	64.71
	Averages					

	O2	NOX
INITIAL ZERO(%fs	10	10
INITIAL SPAN(%fs	95	30
FINAL ZERO (%fs)	10	10
FINAL SPAN (%fs)	95	30
% ZERO DRIFT:	0.00	0.00
% SPAN DRIFT:	0.00	0.00
CAL GAS(ppm or %	20.9	99.94
RANGE (ppm or%)	25	500

RUN 1

	%O2	NOx,ppm	NOx ppm@ 3% O2
NOx	5.94	64.71	77.44

COMPANY:ARCO ALASKA, INC
DATE: 9-6-85
UNIT: KUPARUK BOHN Heater Tag #G1-14-01

RUN# 2
NOX/O2 DATA

	TIME INTERVAL BEGIN	END	CONCENTRATION;FULL SCALE O2;fs	NOx;fs	CONCENTRATION; CORRECTED O2;%	NOx;ppm
1	1300	1305	34.5	24	6.01	69.96
2	1305	1310	34.5	24	6.03	69.96
3	1310	1315	34.5	24	6.05	69.96
4	1315	1320	34.5	24	6.07	69.96
5	1320	1325	34	24	5.96	69.96
6	1325	1330	33.7	24	5.91	69.96
7	1330	1335	34	24	6.00	69.96
8	1335	1340	34	24	6.02	69.96
	1300	1340	34.28	24.00	6.01	69.96
	Averages					

	O2	NOX
INITIAL ZERO(%fs	10	10
INITIAL SPAN(%fs	95.5	30
FINAL ZERO (%fs)	10	10
FINAL SPAN (%fs)	98	30
% ZERO DRIFT:	0.00	0.00
% SPAN DRIFT:	2.62	0.00
CAL GAS(ppm or %	20.9	99.94
RANGE (ppm or%)	25	500

RUN 2

	%O2	NOx,ppm	NOx ppm@ 3% O2
NOx	6.01	69.96	84.07

COMPANY:ARCO ALASKA, INC
DATE: 9-6-85
UNIT: KUPARUK BOHN Heater Tag #G1-14-01

RUN# 3
NOX/02 DATA

	TIME INTERVAL BEGIN	END	CONCENTRATION;FULL SCALE 02;fs	NOx;fs	CONCENTRATION; CORRECTED 02;%	NOx;ppm
1	1345	1350	34	24	5.97	69.96
2	1350	1355	34	24	5.97	69.96
3	1355	1400	34	24	5.97	69.96
4	1400	1405	34	24	5.97	69.96
5	1405	1410	34	24	5.97	69.96
6	1410	1415	34	24	5.97	69.96
7	1415	1420	34	24	5.97	69.96
8	1420	1425	34	24	5.97	69.96
	1345	1425	34.00	24.00	5.97	69.96
	Averages					

	02	NOX
INITIAL ZERO(%fs	10	10
INITIAL SPAN(%fs	94	30
FINAL ZERO (%fs)	10	10
FINAL SPAN (%fs)	94	30
% ZERO DRIFT:	0.00	0.00
% SPAN DRIFT:	0.00	0.00
CAL GAS(ppm or %	20.9	99.94
RANGE (ppm or%)	25	500

RUN 3

	%02	NOx,ppm	NOx ppm@ 3% 02
NOx	5.97	69.96	83.88

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX B

FUEL ANALYSIS & F FACTOR

CLIENT:ARCO Alaska
UNIT:KUTP Bohn Crude Heater
REPORT#:50-022
DATE:9-06-85

Expansion Factor x Mole% = exhaust

EPA "F" FACTOR FOR FUEL GAS

FUEL COMPONENT	C	H	EXPANSION FACTOR	COMPONENT MOLE %	EXHAUST DSCF (0)/ SCF FUEL
METHANE	1	4	8.57	84.14	7.21
ETHANE	2	6	15.25	7.57	1.15
PROPANE	3	8	21.92	4.31	0.94
(ISO-BUTANE)	4	10	28.6	0.65	0.19
NORM-BUTANE	4	10	28.6	1.32	0.38
(ISO-PENTANE)	5	12	35.28	0.40	0.14
NORM-PENTANE	5	12	35.28	.27	0.10
HEXANE +	6	14	41.95	0.13	0.05
AIR (N2+02)	-	-	1	0.32	.0032
C02	-	-	1	0.89	.0089
H2S	-	2	1	0	0
			TOTAL	100	10.18

Where does .27 come from? anderson?

App B

10.17	DSCF EXHAUST PER SCF OF FUEL GAS AT ZERO % OXYGEN
1077.3	NET BTU/SCF OF FUEL GAS
1189.4	GROSS BTU/SCF OF FUEL GAS
8552.54	DSCF/MMBTU (EPA "F" FACTOR @ 60 'F & ZERO % OXYGEN)
8682.78	DSCF/MMBTU (EPA "F" FACTOR @ 68 'F & ZERO % OXYGEN)

CLIENT:ARCO Alaska
UNIT:KUTP Bohn Crude Heater
REPORT#:50-022
DATE:9-06-85

EPA "F" FACTOR FOR FUEL GAS

FUEL COMPONENT	C	H	EXPANSION FACTOR	COMPONENT MOLE %	EXHAUST DSCF (0)/ SCF FUEL
METHANE	1	4	8.57	84.14	7.21
ETHANE	2	6	15.25	7.57	1.15
PROPANE	3	8	21.92	4.31	0.94
(ISO-BUTANE)	4	10	28.6	0.65	0.19
NORM-BUTANE	4	10	28.6	1.32	0.38
(ISO-PENTANE)	5	12	35.28	0.40	0.14
NORM-PENTANE	5	12	35.28	.27	0.10
HEXANE +	6	14	41.95	0.13	0.05
AIR (N2+02)	-	-	1	0.32	.0032
C02	-	-	1	0.89	.0089
H2S	-	2	1	0	0
			TOTAL	100	10.18

10.17	DSCF EXHAUST PER SCF OF FUEL GAS AT ZERO % OXYGEN
1077.3	NET BTU/SCF OF FUEL GAS
1189.4	GROSS BTU/SCF OF FUEL GAS
8552.54	DSCF/MMBTU (EPA "F" FACTOR @ 60 'F & ZERO % OXYGEN)
8682.78	DSCF/MMBTU (EPA "F" FACTOR @ 68 'F & ZERO % OXYGEN)

ARCO ALASKA, INC.
PRUDHOE BAY CENTRAL LABORATORY
ANALYSIS REPORT
****

19 SEP 1985

SAMPLE# G25101 ARCHIVE# G69601:ZA

location:
KUPARUK DPF#1
company:
ARCO
sample month: day:
9 6
year: hour: sample point description
1985 1055 KUTP FUEL GAS
sample description
FUEL GAS
temp: sample PSIG: line PSIG: meter#
105.5 ** 163 **
requestor
M. SCHAUER

PROPERTY	VALUE	
SAMPLE TIME	1055	HOURS
TEMPERATURE	105.5	DEG.F
LINE PRESSURE	163	PSIG
NITROGEN	.32	MOL %
#METHANE	84.14	MOL %
CARBON DIOXIDE	.89	MOL %
&ETHANE	7.57	MOL %
PROPANE	4.31	MOL %
ISO-BUTANE	.65	MOL %
N-BUTANE	1.32	MOL %
ISO-PENTANE	.4	MOL %
N**PENTANE	.	MOL %
C6+	.	MOL %
HYDROGEN SULFIDE	***	
GROSS DRY (IDEAL GAS)	1[illegible]4	BTU/CF
NET (IDEAL GAS)	[illegible]7.3	BTU/CF
GROSS SATURATED IDEAL	1171.5	BTU/CF
SP GRAVITY (CALC.)	.687	.....
SP GRAVITY (MEAS.)	***	

COMMENTS:

COMPLETED BY.....

REVIEWED BY:.....

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX C

RAW FIELD DATA

Bohn Heater (Arco tag #g1-14-01) 9/6/85

44.44 MMBTU/hr output
located at Kuparuk unit topping plant.

Two 4' ports on a horizontal plane 90° apart approximately 5.5 diameters downstream and two (2) diameters upstream from a disturbance in the flow.

Stack dia: 4 ft. Stack area: 12.57 ft.^{2}

Static pressure -0.14

pt #	inches from edge	Td
1	2.1	794°F
2	7.0	789°F
3	14.2	792°F
4	33.8	
5	41.0	
6	45.9	

Present:

Jim Ives - Arco

Testers:

Leslie A. Johnson - PCES
Andy Winkler - PCES

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX D

QUALITY ASSURANCE

Scott Specialty Gases
a division of Scott Environmental Technology, Inc.
PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

PETRO CHEM ENV.
ATTN: JIM MARCHESINI
3207 ANTONINO
BAKERSFIELD, CA 93308

Date Shipped 9/27/85
Our Project No: 330404
Your P.O. No: VERBAL
Page 1 of 2

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number AAL-14186 Certified Accuracy ±1 % NBS Traceable Analysis Dates: First 9/18/85 Last 9/26/85

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
SULFUR DIOXIDE	22.66 ppm	3/26/86	ELECTROCHEMICAL	1694/1693	22.65 ppm	22.66 ppm
NITROGEN	BALANCE				22.62 ppm	22.66 ppm
					22.56 ppm	22.68 ppm

Cylinder Number AAL-14186 Certified Accuracy ±1 % NBS Traceable Analysis Dates: First 9/16/85 Last 9/23/85

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
NITRIC OXIDE	99.94 ppm	3/23/86	CHEMILUMINESCENCE	1684/1683	99.92 ppm	99.85 ppm
NITROGEN	BALANCE				99.42 ppm	99.99 ppm
					99.69 ppm	99.99 ppm

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No:

Analyst GREG WIMMER Approved By FRANCIS E. NEVILLE

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases a division of Scott Environmental Technology, Inc.
PLUMSTEADVILLE, PA. 18949 PHONE: 215-766-8861 TWX: 510-665-9344

Date Shipped 9/27/85
Our Project No: 330404
Your P.O. No: VERBAL
Page 2 of 2

PETRO CHEM
ATTN: JIM MARCHESINI

CERTIFICATE OF ANALYSIS – EPA PROTOCOL GASES*

(Concentrations are in mole % or ppm)

Cylinder Number AAL-14186 Certified Accuracy ±1 % NBS Traceable Analysis Dates: First 9/18/85 Last 9/26/85

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND
CARBON MONOXIDE	25.13 ppm	3/26/86	NDIR	1679c/2614	25.17 ppm	25.16 ppm
NITROGEN	BALANCE				25.04 ppm	25.12 ppm
					25.09 ppm	25.11 ppm

Cylinder Number _____ Certified Accuracy _____ % NBS Traceable Analysis Dates: First _____ Last _____

COMPONENTS	CERTIFIED CONC	EXPIRATION DATE	ANALYTICAL PRINCIPLE	PRIMARY STANDARD NBS/SRM's	REPLICATE CONCENTRATIONS FIRST	REPLICATE CONCENTRATIONS SECOND

*We hereby certify the cylinder gas has been analyzed according to EPA Protocol No:

Analyst Greg Wimmer GREG WIMMER Approved By FRANCIS E. NEVILL

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

PETRO-CHEM ENVIRONMENTAL SERVICES

INSTRUMENT LINEARITY TEST

DATE: October 9, 1985

OPERATOR: A. Winkler

MANUFACTURER: Thermo-Electron

ANALYZER: CO

MODEL: 48

SERIAL #: 48-17394-169

CALIBRATION GASES: EPA Protocal 1

HIGH CONCENTRATION:

LOW CONCENTRATION: 64 ppm CO

DILUTION GAS: N_2 (zero grade)

INSTRUMENT RANGE: 0 - 100 ppm

INSTRUMENT MODE SETTING: 0 - 30 sec. time constant

GAS BLENDER SETTINGS:

INSTRUMENT RESULTS

Blend Gas (L/Min)	Dilution Gas (L/Min)	Blended Value	Instrument Value	% Deviation
0.0	2.0	0	0	0.0
2.0	0.0	64	64	0.0
1.5	0.5	48	47	0.2
1.0	1.0	32	32	0.0
0.5	1.5	16	16	0.0
0.0	2.0	0	0	0.0
2.0	0.0	64	64	0.0

PETRO-CHEM ENVIRONMENTAL SERVICES

INSTRUMENT LINEARITY TEST

DATE: October 9, 1985

OPERATOR: A. Winkler

MANUFACTURER: Teledyne

ANALYZER: Oxygen

MODEL: 320 AX

SERIAL #: 90840

CALIBRATION GASES: EPA Protocal 1

HIGH CONCENTRATION:

LOW CONCENTRATION: 21 (ambient)

DILUTION GAS: N_2 (zero grade)

INSTRUMENT RANGE: 0 - 25%

INSTRUMENT MODE SETTING:

GAS BLENDER SETTINGS:

INSTRUMENT RESULTS

Blend Gas (L/Min)	Dilution Gas (L/Min)	Blended Value	Instrument Value	% Deviation
0.0	2.0	0	0	0.0
2.0	0.0	21	21	0.0
1.5	0.5	15.7	15.5	1.0
1.0	1.0	10.5	10.7	0.8
0.5	1.5	5.2	5.2	0.0
0.0	2.0	0	0	0.0
2.0	0.0	21	21	0.0

PETRO-CHEM ENVIRONMENTAL SERVICES

INSTRUMENT LINEARITY TEST

DATE: October 9, 1985

OPERATOR: A. Winkler

MANUFACTURER: Thermo-Electron

ANALYZER: NOx

MODEL: 10

SERIAL #: 10A/R-17380-169

CALIBRATION GASES: EPA Protocal 1

HIGH CONCENTRATION:

LOW CONCENTRATION: 277 ppm NOx

DILUTION GAS: N_2 (zero grade)

INSTRUMENT RANGE: 0 - 500 ppm

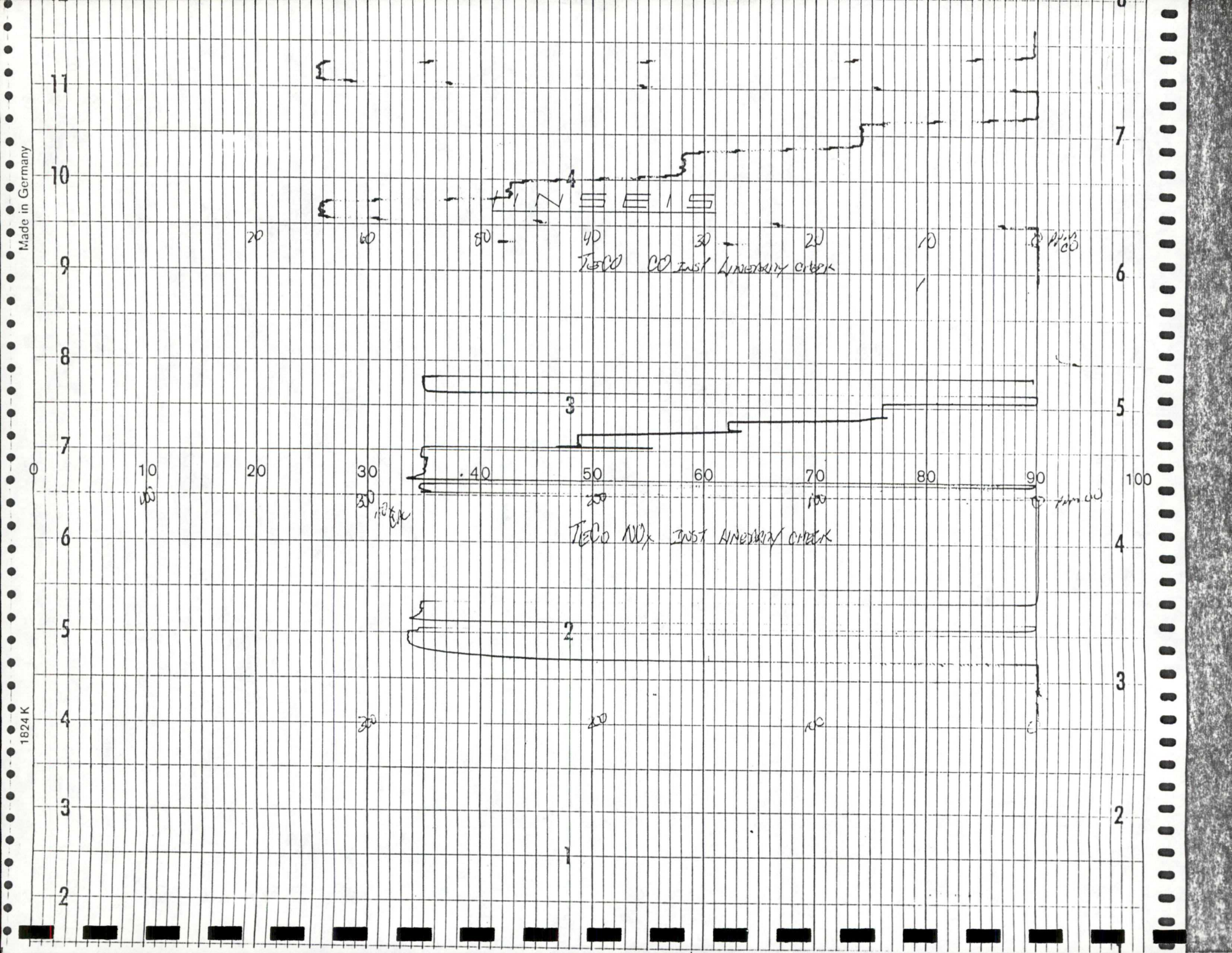
INSTRUMENT MODE SETTING: Converter temperature at 650°C, NOx

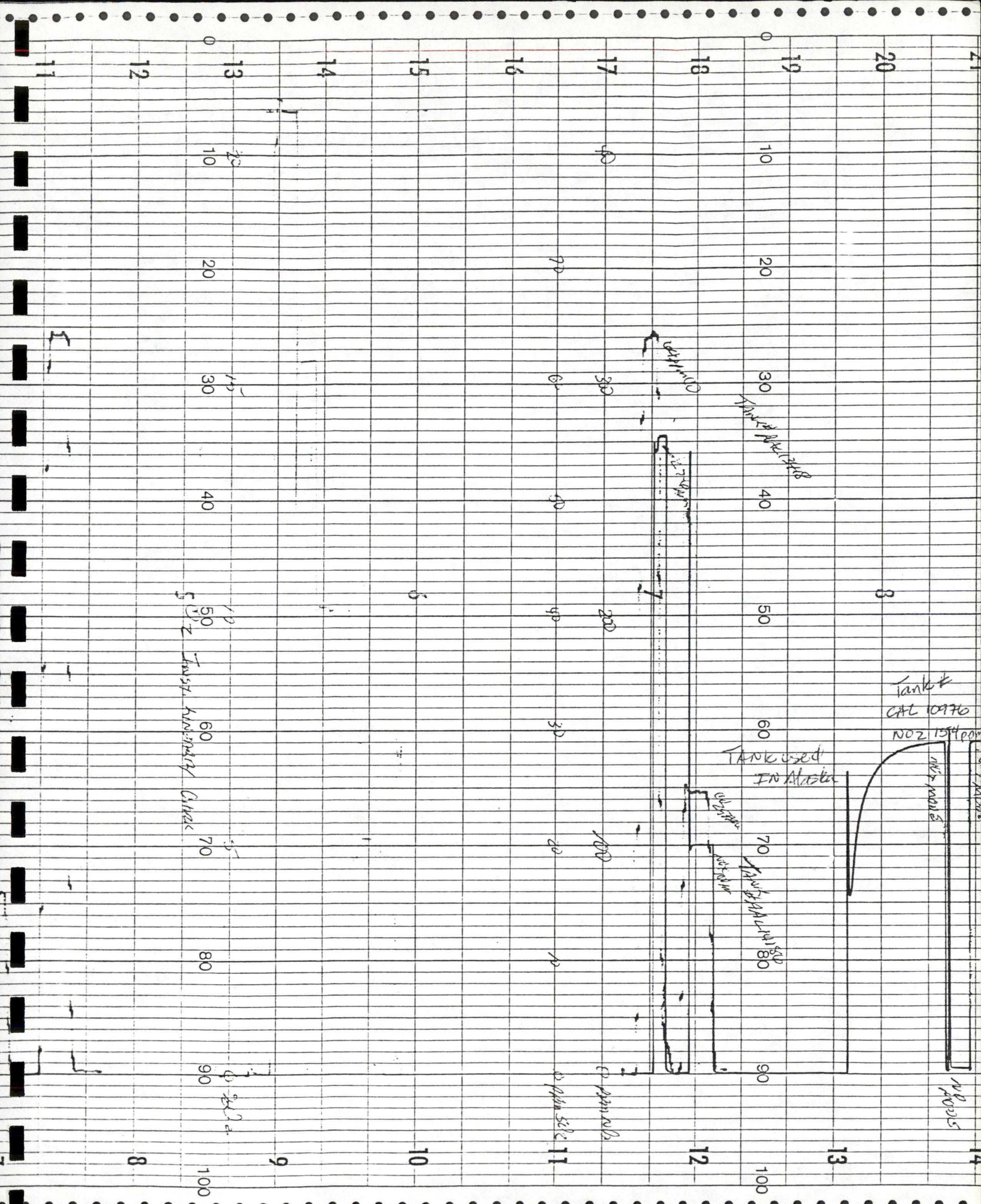
GAS BLENDER SETTINGS:

Blend Gas (L/Min)	Dilution Gas (L/Min)
0.0	2.0
2.0	0.0
1.5	0.5
1.0	1.0
0.5	1.5
0.0	2.0
2.0	0.0

INSTRUMENT RESULTS

Blended Value	Instrument Value	% Deviation
0	0	0.0
277	277	0.0
208	207	0.2
138	138	0.0
69	70	0.2
0	0	0.0
277	276	0.0


Made in Germany
1824 K
TESCO CO INST LINEARITY CHECK
TESCO NOx INST LINEARITY CHECK


Tank #
CAL 10976
NO2 1554 ppm
TANK used
IN Alaska

ARCO ALASKA, INC.

INSTRUMENT AND CALIBRATION DATA

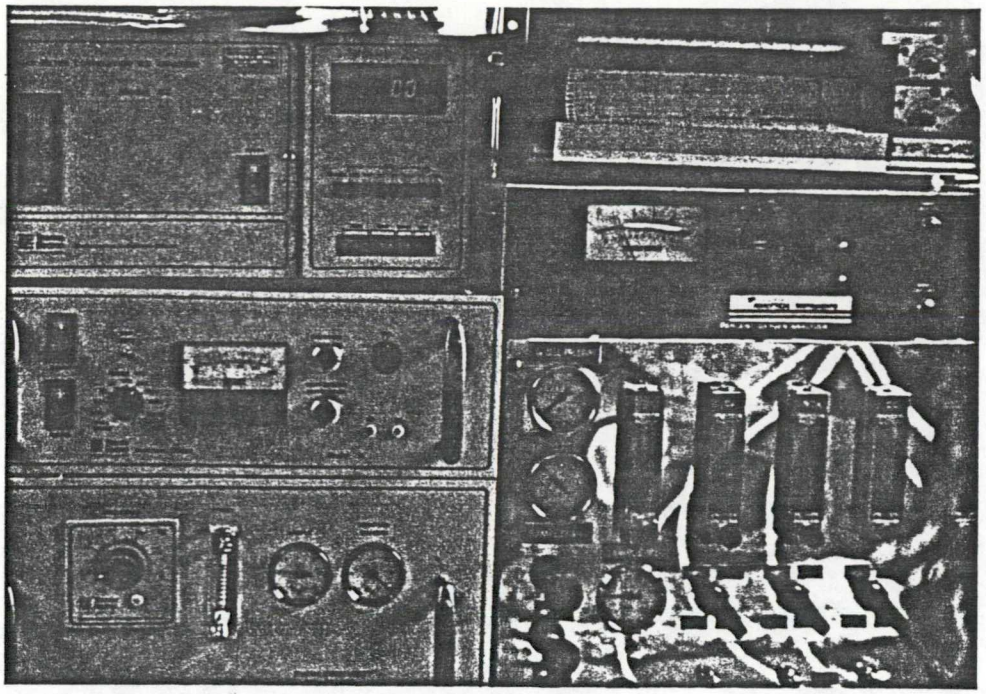
ANALYZER		RANGE	ZERO GAS	SPAN GAS
TYPE:	NO/NOx			
MANUFACTURER:	Thermo Electron	0-500	Ambient Air	99.94 1/
MODEL:	10			
SERIAL #:	10 A/R-17380-169			
TYPE:	O_2			
MANUFACTURER:	Teledyne	0-25%	N_2 1/	Ambient Air
MODEL:	320 AX			
SERIAL #:	90840			

1/ Cylinder AAL-14186 (see certification data Appendix D)

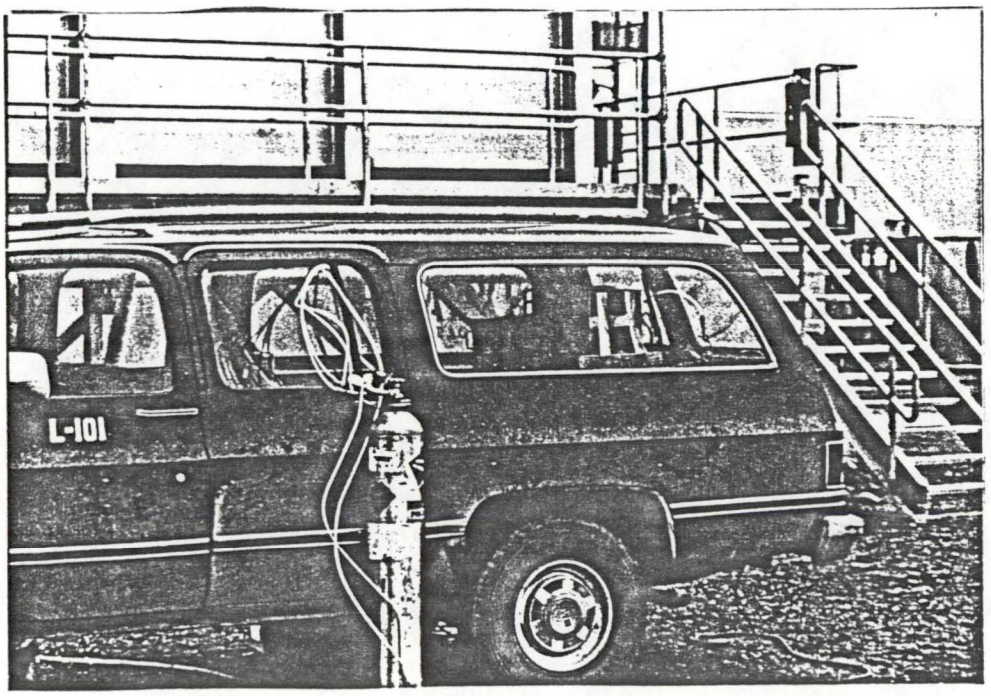
PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX E

SAMPLE SITE PHOTOS

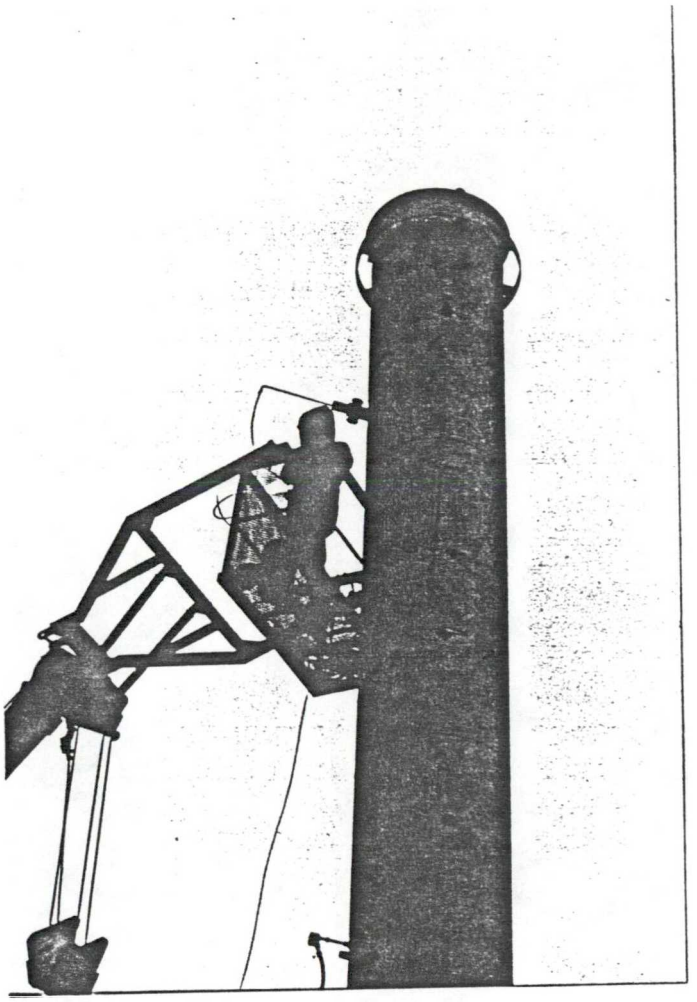


Instrument set-up



Instrument vehicle &calibration gases

KUPARUK UNIT TOPPING PLANT

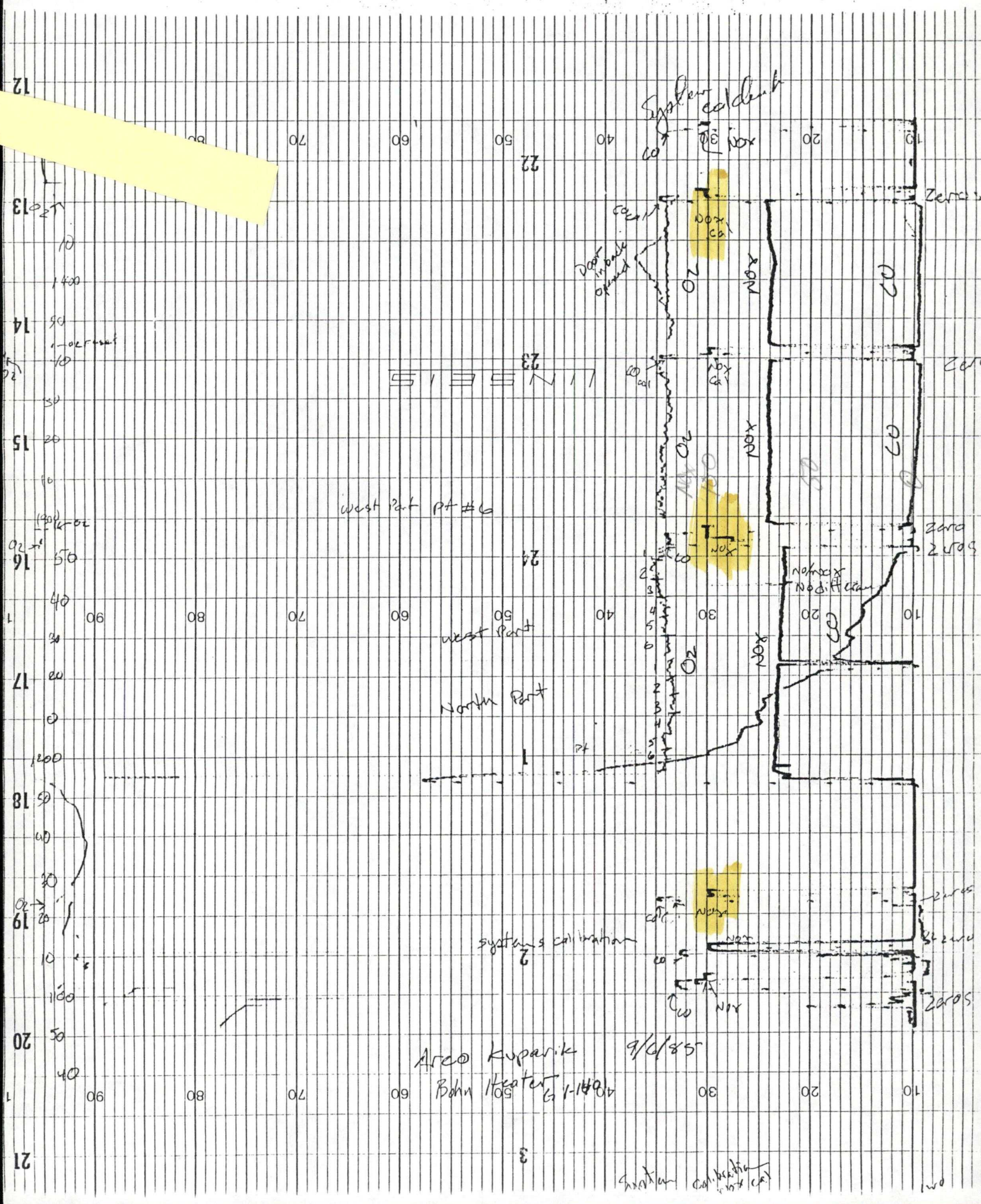


Bohn Inc. 44.44MMBtU/hr Heater

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX F

STRIP CHARTS


Arco Kuparik 9/6/85
Bohn Heater G-1-140
System calibration
System cal check
West Part pt #6
West Part
North Part
Door in back opened
O2
NOx
CO
NOx cal
CO cal
Zero
Zeros
No NOx No diff

PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX G

RELATED CORRESPONDENCE

PETRO
CHEM
ENVIRONMENTAL
SERVICES

A Division of Cal State Electric Inc.

SOURCE TEST PLAN

I. Client: Kuparuk River Unit Owners Represented By:
ARCO ALASKA INCORPORATED
P O Box 100360
Anchorage, Alaska 99510

Attention: Jim Ives (907) 263-4307

II. Testing Firm: Petro-Chem Environmental Services
3207 Antonino Avenue
P. O. Box 5126

Attention: Leslie Johnson
(805) 327-7300

III. Unit To Be Tested:

One (1) 44.44 MMBTU/hr. Bohn Heater (Arco tag # G1-14-01). The unit will be operating on gas for a fuel, with a normal heat release approximately 35.56 MMBTU/hr.

IV. Procedures:

Determination of NOx, and O_2 concentrations and emissions from the 44.44 MMBTU/hr heater located in Kuparuk River Alaska. Monitoring of NOx, and O_2 will be by continuous monitoring analyzers (see attachment A) and documented with an analog strip chart recorder. Three, forty minute test runs will be conducted at each unit with zero and span calibrations before and after each test. During each test the units operation parameters will be monitored to document its load capacity. An oxygen traverse will be performed on all turbines and heaters to determine test run sampling points. If upon completion of the oxygen traverse, no deviation is found, single point sampling will be done on the heater.

PETRO
CHEM
ENVIRONMENTAL
SERVICES

Procedures Cont.

Volume flows and operating conditions of each unit will be calculated using the process conditions which are documented, and will be made available, by the process engineer. A gas sample will be taken for each unit and analyzed by ARCO's Laboratory. If the available information does not satisfy EPA Region X DEC, EPA Method 2, 3, and 4, will be performed to document volume flows.

The analyzers which are to be used for testing are:

Thermo-Electron, Model 10;
Chemiluminescent NO/NOx Analyzer
Serial No: 10A-R-17380

Teledyne Instruments, Model 320-AX
Fuel Cell O_2 Analyzer
Serial No: 50840

Testing Dates: September 6 or 7 1985

Attachment A

CONTINUOUS EMISSION MONITORING SYSTEM (CEMS)

Reference: BAAQMD, Manual of Procedures; ST-13A, St-19A, Jan 1982 State of California, Air Resources Board, Test Methods 1-100, June 1979 CRF 40 parts 53 to 80, Test Methods 7E and 20, 1985.

INSTRUMENTATION SUMMARY:

A constant sample of flue gas was extracted, dried, filtered, and delivered to an instrument manifold system for distribution to one or more analyzers. Instrument results are recorded on an analog strip chart recorder. System calibration checks are performed at the beginning and end of each day as well as calibration check at the beginning and end of each test run. Final data reduction includes zero and calibration drift corrections.

SAMPLE CONDITIONING SYSTEM:

Consists of a borosilicate glass tube or 316 grade stainless steel probe fitted with a cindered stainless steel or pyrex glass wool particulate filter. The probe is fitted with a teflon (TFE) sample line which connects to a water condensation system located at the sources. The condensation system consists of three 500 ml glass impingers connected in a series, immersed in an ice bath. The gas is delivered to the instrument van with a teflon line (3/8"O.D.) through an in line Balston particulate filter drawn by a teflon coated diaphram pump. The sample system is leak checked prior to sampling by plugging the end of the sample probe and adjusting the sample pump to it's maximum rate (approximately 22" Hg). The manifold is bypassed and the leak rate monitored through a gas meter or low range flow meter.

MANIFOLD SYSTEM:

Sample gas is delivered to each analyzer through a five (5) way valve and regulated with a needle valve flowmeter. Manifold pressure is controlled by a back pressure regulator which is typically set at three (3) psi. Zero gas (N_2) and calibration gases are delivered to the analyzers using the same five-way valve and flowmeter. All manifold parts are glass, stainless steel, or teflon materials.

CALIBRATION PROCEDURES:

A. System Calibration Procedures:
System calibration checks are performed at the beginning and end of each test day to insure against sample system leaks or contamination. Calibration gas is introduced at the sample probe tip at a normal sample rate and vacuum, the final instrument value must be within ±5% of the calibration gas value.

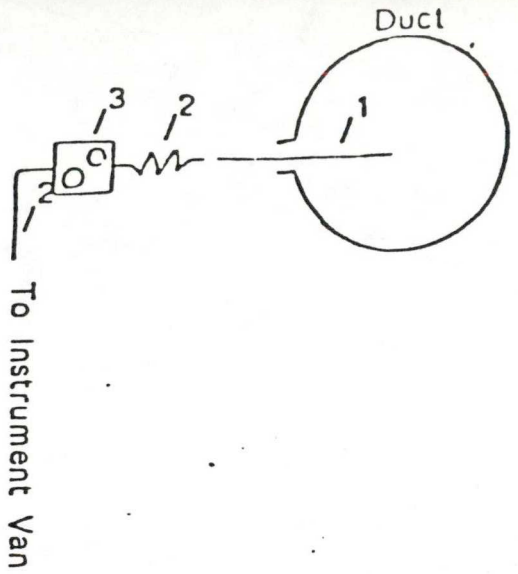
B. Manifold Calibration:
Instrument calibration checks are performed and adjustments made before and after each test run. Each analyzer is checked with a zero grade nitrogen gas for a zero baseline and then with a calibration gas similar to the expected sample concentration (60-90% of full scale). Calibration gases used in both manifold and system calibrations are with EPA protocol No. 1 gas (traceable to National Bureau of Standards SRM,) or with gases recently analyzed by EPA Reference Methods. All zero and calibration checks are documented and noted on the recorder strip charts.

Not Method 20

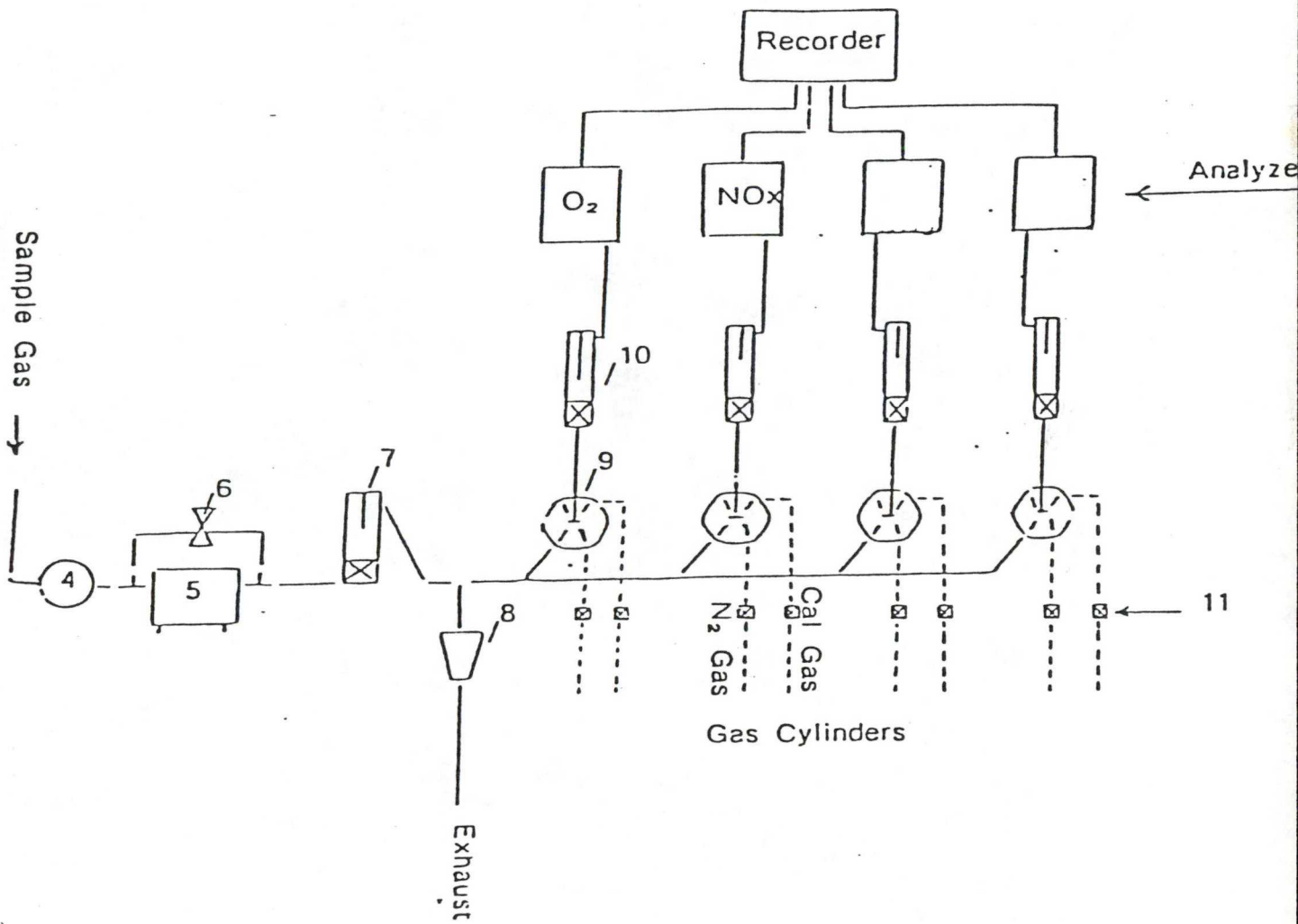
ANALOG STRIP CHART DATA REDUCTION:

Analog recordings were averaged of time increments as shown on the data pages (typically 5, 10, or 20 minute increments). Data for each incriment was recorded at an average percent of full scale. The readings were then compared with the zero and calibration readings for calculation of the average concentration for each time increment. Any deviation of the zero and calibration readings from the start to the end of a test period was corrected by calculating apparent zero and calibration readings for the mid-point or each time incriment. The average concentrations were then calculated from the sample readings and the apparent zero and span readings.

PNEUMATIC DIAGRAM



1) 316 Stainless Steel Probe
2) Teflon Sample Line
3) Sample Gas Conditioner
4) Filter
5) Teflon Coated Diaphram Pump
6) By-Pass Control Valve
7) Sample Flowmeter
8) Back-Pressure Regulator
9) 5-Way Gas Selection Valve
10) Instrument Flowmeter
11) Metering Valves



PETRO
CHEM
ENVIRONMENTAL
SERVICES

APPENDIX H

RESUME OF QUALIFICATIONS

LESLIE A. JOHNSON — Resume' of Qualifications

EDUCATION:

1974-1978	California Polytechnic State University San Luis Obispo, CA School of Natural Resource Management B.S. Environmental Science/Natural Resource Management

WORK EXPERIENCE:

August 1980 to December 1984	Chemecology Corporation 18823 Porterville Highway Bakersfield, CA 93308
January 1985 to Present	Petro-Chem Environmental Services 3207 Antonino Avenue Bakersfield, CA 93308

JOB CLASSIFICATION:

Project Supervisor/Air Quality Consultant/Division Manager

Job Description: Ms. Johnson has had extensive experience in field source testing, technical report writing and administrative organization of a source testing company. She has compiled approximately 250 technical reports for both engineering and compliance testing for EPA regions IX and X, CARB, Kern County APCD, South Coast AQMD, Bay Area APCD, and other California Agencies.

The job requirements include bidding, test supervision, and report compilation while maintaining an intimate contact with the client and regulatory agency. In order to insure proper testing methodoligy and report documentation. Ms. Johnson's out-of-state testing experience includes Prudoe Bay-Alaska, Hawaii, and the Netherlands.

Specific areas of expertise include EPA reference methods 1-8, continuous instrument sampling, analytical chemistry, personnel training and business management.

ANDY WINKLER — Resume' of Qualifications

EDUCATION:

1974-1976	Bakersfield Junior College Bakersfield, California Concentration: General Education
1977-1980	Chico State University Chico, California School of Agriculture B.S. Agriculture Concentration: Range Management, Plant & Soil Science

WORK EXPERIENCE:

August 1980 to January 1985	Chemecology Corporation of Bakersfield 18823 Porterville Highway Bakersfield, CA 93308
January 1985 to Present	Petro-Chem Environmental Services 3207 Antonino Avenue Bakersfield, CA 93308

JOB CLASSIFICATION:

Source Test Team Leader/Air Quality Specialist

Job Responsibilities- Supervision of test teams during both compliance and engineering testing. Mr. Winkler has worked closely with clients from initial contact to the review of final reports. Since 1980 he has compiled and written approximately 150 reports for such agencies as: Environmental Protection Agency - Region IX and X, Kern County APCD, Monterey Bay Unified APCD, Fresno County APCD, Santa Barbara County APCD, and South Coast APCD.

Specific areas of expertise include: Extensive testing with continuous instruments, EPA reference method source sampling, analytical chemistry, equipment calibration and personnel training in continuous instruments, instrument manifold fabrication, and field sampling techniques. Some of Mr. Winkler's testing areas include Coopers Engineering-Germany, Sun Production, Texaco Inc., and extensive testing in the Prudoe Bay Area for both Sohio Alaska and Arco Alaska Companies.